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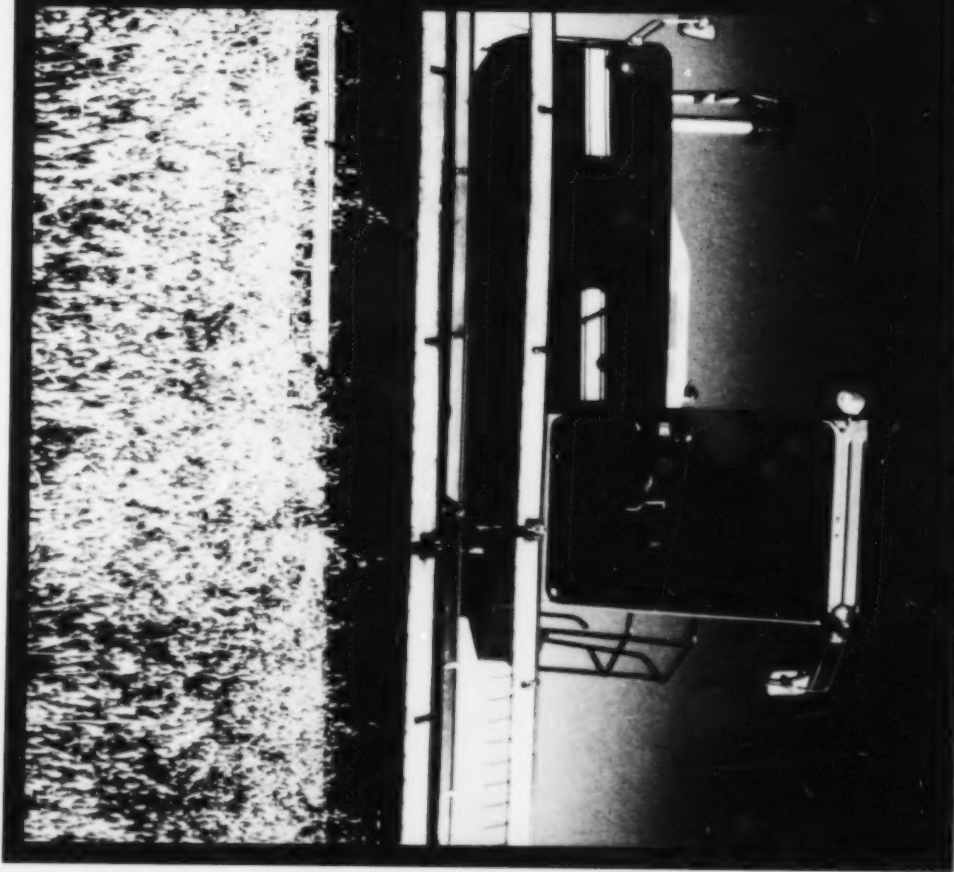
Farm Machinery Costs

*as a guide to
custom rates*

Alberca

AGRICULTURE

Farm Business Management Branch
Agdex No. 825/4



1992

FOREWORD

Since 1975, Alberta Agriculture has annually undertaken to provide information on the cost of owning and operating farm machinery.

This publication provides technical information on current machinery prices, repair rates, performance capacity, fuel consumption and price. The information is organized into fixed and variable costs to provide a basis for budgeting machinery costs. The cost calculations are intended to be used as approximate cost figures. It is recommended that adjustments be made as desired to suite individual situations. In addition, the 1991 custom rates have been included for comparison.

The major change between this year and last is the reduction in interest rates. This year, for calculation purposes, the Bank of Canada rate is presumed to be 7 per cent, 3 per cent less than last year. As a result, the fixed cost of large

ticket items is slightly reduced. Variable costs are the same due to similar fuel costs. The overall effect is slightly lower total costs this year.

We gratefully acknowledge the services of Cal Ausenhus who conducted the machinery cost survey. Sherry Burnett from the Farm Business Management Branch of Alberta Agriculture also contributed to updating this publication. The Market Rate Survey data was provided from a joint project with Statistics Branch.

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INTRODUCTION

This publication outlines steps in the identification of costs incurred by some of the machinery units used in field and livestock operations.

HOW TO USE THE GUIDE

1. If you are a full-time custom operator, then use the Total Machine Cost + Labor + Profit for estimating a charge. Be sure to adjust fixed costs if your annual hours of use differ much from those quoted. The profit margin can be adjusted to meet the market conditions.
2. If you are doing custom work on a good neighbor payment basis, then fixed costs of owning the machine may be ignored since they represent an annual cost incurred whether or not custom work is done. However, the rate should cover all variable costs which include an allowance for repairs. Labor and profit margin can be adjusted to meet each situation.
3. If you plan to do custom work in addition to your own work, so as to partly justify ownership of a larger machine, then the custom charge should cover variable costs, labor, a profit margin plus a proportion of fixed costs calculated as follows:
$$\text{Proportion of Fixed Costs} = \frac{\text{Hours of Custom Work}}{\text{Total Annual Hours of Use}} \times \text{Total Fixed Costs}$$
4. If you are renting out machinery, then you will wish to at least cover fixed costs and those variable costs such as lubrication and repairs which may not be already covered by the renter.
5. If you wish to assess a rate for a full operation such as silage making, which requires several machines, then add the hourly costs of each activity, making sure that there is neither omission nor duplication. Use worksheets on pages 11 to 16.
6. The purchase cost estimates are based on average cash prices as of March, 1992 for each class of machine. These represent current replacement costs which should be budgeted and charged for, even if you do custom work with older machines, unless the older machine will not do a comparable job.

KEY ASSUMPTIONS

1. Estimated years of life, annual hours of use and annual repair rates are specified for each type of machine. The salvage value of a new machine is considered to be 10 percent of the new price.
2. Diesel fuel is charged at \$.22 per litre, purple gas at \$.35 per litre and propane at \$.17 per litre. Fuel is net of all rebates.

3. Return on investment is calculated using a Bank of Canada prime rate of 7% with an additional allowance for risk of 6%. Inflation was included at a 3% rate. Calculations follow the procedures on pages 11 to 16.

4. Income tax considerations have not been included in the calculations.

OTHER CONSIDERATIONS

1. Favorable or unfavorable working conditions such as size of job, distance, access, topography, soil type and possible down time, may modify the guide figures. Per hour charges allow for some of these situations.
2. Charges per unit of output such as per acre, per bushel or per bale, defined on work rates per hour, may be quite different from those quoted. Per hour charging overcomes some of these uncertainties.
3. You can adjust the labor charge according to your actual cost of hired work or the opportunity cost of your own labor.
4. If your experience and farm records suggest that other costs and assumptions would suit your situation, then recalculate using the worksheets on pages 11 to 16.
5. Earlier and faster may be cheaper. There are costs attached to late completion of operations. The rewards for timely quality work, quickly completed by large machines, is only earned if the support system, including seed and fertilizer supplies, and grain trucking is well organized.

OTHER INFORMATION SOURCES

Custom Rates Survey Summary - 1992, Alberta Agriculture, Agdex 825-9, March 1992
Know Your Farm Machinery Costs, Alberta Agriculture, Agdex 825-6, March 1989
Leasing vs. Buying Farm Machinery, Alberta Agriculture, Agdex 825-19, May 1985
Replacing Farm Machinery, Alberta Agriculture, Agdex 825-18, July 1983
What is A Fair Charge For Custom Work?, Alberta Agriculture, Agdex 825-15, July 1983



Years Life = 13
 Annual Use = 200, 400*, 600
 Annual Repair Rate = 3% of Replacement Cost

TRACTOR - 2WD

Annual Hours Used	Diesel Use Litres/Hr	Current Replace Cost \$	Fixed Cost \$/Hr	Variable Cost (Labor Omitted*) \$/Hr	Total Machine Cost \$/Hr	Market Rate Survey 1991
40 HP 200 400 600	8	21000	15.17 7.59 5.06	3.60	18.77 11.19 8.65	0.23 per HP/Hr
60 HP 200 400 600	13	25000	18.06 9.03 6.02	5.16	23.23 14.20 11.18	
80 HP 200 400 600	17	41000	29.62 14.81 9.87	7.38	37.00 22.19 17.25	
100 HP 200 400 600	22	56000	40.46 20.23 13.49	9.77	50.23 30.00 23.25	
120 HP 200 400 600	28	65000	46.96 23.48 15.65	11.96	58.92 35.44 27.61	
140 HP 200 400 600	32	77000	55.78 27.89 18.59	13.87	69.65 41.76 32.46	0.21 per HP/Hr
160 HP 200 400 600	38	83000	60.05 30.03 20.02	15.84	75.89 45.87 35.86	
180 HP 200 400 600	39	97000	70.27 35.14 23.42	17.14	87.41 52.28 40.57	

* This annual hours use figure is typical

** Priced without PTO.

TRACTOR - 4WD

Years Life = 13
 Annual Use = 200, 400*, 600
 Annual Repair Rate = 3% of Replacement Cost

	Annual Hours Used	Diesel Use litres/Hr	Current Replace Cost \$	Fixed Cost \$/Hr	Variable Cost (Labor Omitted**) \$/Hr	Total Machine Cost \$/Hr	Market Rate Survey 1991
175 HP	200 400 600	34	95000	68.78 34.39 22.93	15.73	84.51 50.12 38.66	
220 HP	200 400 600	40	106000	76.69 38.35 25.56	18.07	94.76 56.42 43.63	
250 HP	200 400 600	50	117000	84.68 42.34 28.23	21.43	106.11 63.77 49.65	
275 HP	200 400 600	53	120000	86.81 43.40 28.94	22.41	109.22 65.81 51.34	
300 HP	200 400 600	58	131000	94.77 47.39 31.59	24.50	119.27 71.89 56.09	
350 HP	200 400 600	62	150000	108.59 54.29 36.20	26.94	135.52 81.23 63.13	
450 HP	200 400 600	85	185000	133.67 66.83 44.56	35.38	169.05 102.21 79.94	

0.21 per HP/HR

* This annual hours use figure is typical.

** Priced without PTO.

CULTIVATION EQUIPMENT

Implement	Tractor HP	Current Replace Cost \$	POWER UNIT OR SP UNIT		IMPLEMENT		TOTAL Machine Cost		Market Rate Survey 1991
			Fixed Cost \$/Hr	Variable Cost \$/Hr	Fixed Cost \$/Hr	Variable Cost \$/Hr	\$/Hr	Acre/Hr		$/Acre
PLOWS									
Life = 15			Annual Hours Use = 150		Annual Repair Rate = 6% of Replacement Cost				
3 X 16" 3 Point	60	6000	9.03	5.16	5.44	2.40	22.04	2.0	11.02
5 X 16" Semi 3 pt	120	10000	23.48	11.96	9.07	4.00	46.51	3.0	16.17
6 X 16" Trailing	140	15000	27.89	13.87	13.61	6.00	61.37	4.0	15.34
8 X 16" Trailing	220	17000	38.35	18.07	15.42	6.80	78.64	6.0	13.11
10 X 16" Trailing	250	20000	42.34	21.43	18.14	8.00	89.91	7.0	12.84
HD CULTIVATORS									
Life = 15			Annual Hours Use = 250		Annual Repair Rate = 6% of Replacement Cost				
14' Single	80	9500	14.81	7.38	5.17	2.28	29.64	7.0	4.23
22' Wing	120	15000	23.48	11.96	8.16	3.60	47.21	11.0	4.29
31' Wing	160	22000	30.03	15.84	11.97	5.28	63.12	15.0	4.21
42' Wing	220	26000	38.35	18.07	14.15	6.24	76.81	20.0	3.84
60' Wing	350	36000	54.29	26.94	19.59	8.64	109.46	30.0	3.65
FIELD CULTIVATORS									
Life = 15			Annual Hours Use = 250		Annual Repair Rate = 6% of Replacement Cost		5.00 - 6.00 per acre		
16' Wing	60	9000	9.03	5.16	4.90	2.16	21.25	8.5	2.50
22' Wing	80	14000	14.81	7.38	7.62	3.36	33.17	12.0	2.76
32' Wing	120	15000	23.48	11.96	8.16	3.60	47.21	17.0	2.78
42' Wing	160	21000	30.03	15.84	11.43	5.04	62.34	22.0	2.83
DISCS - TANDEM HD									
Life = 15			Annual Hours Use = 150		Annual Repair Rate = 6% of Replacement Cost		5.75 - 11.00 per acre		
16' Single	100	14000	20.23	9.77	12.70	5.60	46.30	7.5	6.44
4' Wing	140	25500	27.89	13.87	23.13	10.20	79.09	12.0	6.26
30' Wing	220	28500	38.35	18.07	25.85	11.40	93.67	16.5	5.68
16' Heavy offset	140	21000	27.89	13.87	19.05	8.40	69.21	7.5	9.23
ROTOVATORS									
Life = 15			Annual Hours Use = 100		Annual Repair Rate = 6% of Replacement Cost				
5' Rotor	80	12000	14.81	7.38	16.33	7.20	45.72	1.2	38.10
6' Rotor	100	16000	20.23	9.77	21.77	9.60	61.37	1.4	43.83
8' Rotor	120	20000	23.48	11.96	27.21	12.00	74.66	1.7	43.92
V-BLADE									
Life = 15			Annual Hours Use = 150		Annual Repair Rate = 6% of Replacement Cost				
21'	100	16000	20.23	9.77	14.51	6.40	50.91	11.0	4.63
28'	160	21000	30.03	15.84	19.05	8.40	73.32	15.0	4.88
42'	250	29000	42.34	21.43	26.31	11.60	101.67	20.0	5.06

400 annual hours of tractor use figures are used to determine above power unit costs

Market Rate Survey 1991

18.00 - 20.00 per acre

5.00 - 6.00 per acre

5.75 - 11.00 per acre

CULTIVATING, SEEDING & SPRAYING EQUIPMENT

Implement	Tractor HP	Current Replace Cost \$	POWER UNIT OR SP UNIT		IMPLEMENT		TOTAL Machine Cost		Market Rate Survey 1991
			Fixed Cost \$/Hr	Variable Cost \$/Hr	Fixed Cost \$/Hr	Variable Cost \$/Hr	\$/Hr	Acre/Hr		$/Acre
ROD WEEDER/MULTIPLEX									
		Life = 15	Annual Hours Use = 150		Annual Repair Rate = 6% of Replacement Cost				
24"	100	11000	20.23	9.77	9.98	4.40	44.38	12.0	3.70
36"	170	15000	23.48	11.96	13.61	6.00	55.05	16.0	3.44
48"	160	22000	30.03	15.84	19.96	8.80	74.82	25.0	2.98
HARROWS									
		Life = 15	Annual Hours Use = 40		Annual Repair Rate = 2% of Replacement Cost				
Spring Tooth 50"	80	9000	14.81	7.38	30.62	4.50	57.30	35.0	1.64
Spring Tooth 70"	120	12000	23.48	11.96	40.82	6.00	82.26	48.0	1.71
Harrow Packers 40"	140	18000	27.89	13.87	61.23	9.00	111.99	25.0	4.48
Harrow Packers 70"	180	24000	35.14	17.14	81.64	12.00	145.92	44.0	3.32
SEED DRILLS									
		Life = 15	Annual Hours Use = 100		Annual Repair Rate = 2% of Replacement Cost				
Press Drill 12"	60	17000	9.03	5.16	23.13	3.40	40.73	6.5	6.27
End Wheel 12"	60	10000	9.03	5.16	13.61	2.00	29.80	6.5	4.59
Hoe Drill 12"	60	18000	9.03	5.16	24.49	3.60	42.29	6.5	6.51
Zero/Min. Till 12"	60	23000	9.03	5.16	31.30	4.60	50.09	4.5	1.13
AIR SEEDER W/CULT									
		Life = 15	Annual Hours Use = 150		Annual Repair Rate = 3% of Replacement Cost				
28"	140	39000	27.89	13.87	35.38	7.80	84.94	16.5	5.13
42"	250	58000	42.34	21.43	52.62	11.60	127.98	25.0	5.12
45" WITH PACK WHEELS	250	75000	42.34	21.43	68.04	15.00	146.80	27.0	5.44
SPRAYER (TWAILER)									
		Life = 15	Annual Hours Use = 50		Annual Repair Rate = 3% of Replacement Cost				
400 Gallon 68"	60	10000	9.03	5.16	27.21	6.00	47.41	35.0	1.35
800 Gallon 80"	60	14000	9.03	5.16	38.10	8.40	60.70	47.0	1.29
SPRAYER (SP)									
		Life = 10	Annual Hours Use = 100		Annual Repair Rate = 3% of Replacement Cost				
130 Gallon 54"	60	24000	39.44	7.20			46.64	40.0	1.17
1000 Gal 54" Float	150	130000	213.66	39.00			252.66	85.0	2.87
320 Gallon 45"	60	30000	49.31	9.00			58.31	35.0	1.67
+ 3/4 Ton 4x4									

3.00 - 5.00
per acre

3.50 - 7.00
per acre

2.00 - 2.25
per acre

FORAGE EQUIPMENT

Implement	Tractor HP	Current Replace Cost \$	POWER UNIT OR SP UNIT		IMPLEMENT		TOTAL Machine Cost		Market Rate Survey 1991
			Fixed Cost \$/Hr	Variable Cost \$/Hr	Fixed Cost \$/Hr	Variable Cost \$/Hr	\$/Hr	Acre/Hr		$/Acre
SWATHER (SF)									
		Life = 15	Annual Hours Use = 100		Annual Repair Rate = 3% of Replacement Cost				
16' Forage & Grain + Conditioner	60	46000	62.72	17.09	79.81	7.0		11.40	
20' Grain	60	41000	55.92	15.59	71.51	10.0		7.15	
SWATHER (PULL-TYPE)									
		Life = 15	Annual Hours Use = 100		Annual Repair Rate = 3% of Replacement Cost				
15' Grain	40	8000	7.59	3.60	10.93	2.40	24.52	7.5	3.27
18' Grain	60	12000	9.03	5.16	16.39	3.60	34.19	10.0	3.42
24' Grain	60	15000	9.03	5.16	20.51	4.50	39.20	12.0	3.27
POWER									
		Life = 15	Annual Hours Use = 50		Annual Repair Rate = 2% of Replacement Cost				
7'	40	5500	7.59	3.60	14.97	2.20	28.35	3.0	9.45
POWER CONDITIONER									
		Life = 15	Annual Hours Use = 100		Annual Repair Rate = 3% of Replacement Cost				
14' SP Diesel	70	49000	66.74	18.84			85.98	7.0	12.23
9' PTO	60	15000	9.03	5.16	20.41	4.50	39.11	5.0	7.82
14' PTO	80	22000	14.81	7.36	29.94	6.60	56.72	6.5	9.03
RAKE									
		Life = 15	Annual Hours Use = 50		Annual Repair Rate = 2% of Replacement Cost				
9' Parallel Bar	40	5000	7.59	3.60	13.61	2.00	26.79	5.0	5.36
FORAGE HARVESTER									
		Life = 12	Annual Hours Use = 100		Annual Repair Rate = 3% of Replacement Cost				
20"	120	20000	23.48	11.96	29.98	6.00	71.42		
26"	180	29000	35.14	17.14	43.48	8.70	104.45		
DUMP WAGON									
		Life = 15	Annual Hours Use = 100		Annual Repair Rate = 2% of Replacement Cost				
Small (700 cu ft)	0	11500	15.65	2.30			17.95		
Medium (900 cu ft)	0	15000	20.41	3.00			23.41		
Large (1200 cu ft)	0	21000	28.58	4.20			32.78		

4.00 - 6.00 per acre

8.00 - 12.00 per acre

4.00-5.50/tonne
120 - 120/hr

4.00 - 6.00
per acre

8.00 - 12.00
per acre

4.00-5.50/cords
120 - 120/hr

BALING EQUIPMENT

Implement	Tractor HP	Current Replace Cost \$	POWER UNIT OR SP UNIT		IMPLEMENT					Twine Cost \$/Bale	Total Cost \$/Bale	Market Rate Survey 1991	
			Fixed Cost \$/Hr	Variable Cost \$/Hr	Fixed Cost \$/Hr	Variable Cost \$/Hr	TOTAL Machine Cost \$/Hr	Bales/Hr	\$/Bale				
BALERS (STANDARD)													
		Life = 10	Annual Hours Use = 80		Annual Repair Rate = 3% of Replacement Cost								
Small 14" x 18"	40	12000	7.59	3.60	24.65	4.50	40.14	200	0.20	0.08	0.28	0.30-0.45 hour	
Large 16" x 18"	60	18000	9.03	5.16	36.98	6.75	57.92	300	0.19	0.08	0.27		
LARGE ROUND													
		Life = 12	Annual Hours Use = 60		Annual Repair Rate = 2% of Replacement Cost								
800 Lb. Bale	60	20000	9.03	5.16	50.13	6.67	70.99					5.00-6.50 per bale	
1500 Lb. Bale	60	25000	9.03	5.16	62.54	8.33	85.07						
BIG SQUARE													
		Life = 10	Annual Hours Use = 150		Annual Repair Rate = 3% of Replacement Cost								
1500-2000 Lb. Bale	160	79000	30.03	15.84	86.56	15.80	148.22					11.50 per bale	
BALE WAGONS													
		Life = 12	Annual Hours Use = 80		Annual Repair Rate = 3% of Replacement Cost								
SP 160 Bale	40	80000	149.92	30.00		179.92	400	0.45	0.00	0.45	0.30-0.35 per bale		
PULL 142 Bale	80	28000	14.81	7.38	52.47	10.50	85.16	300	0.28	0.00		0.28	
PULL 104 Bale	60	25000	9.03	5.16	46.85	9.38	70.42	240	0.29	0.00		0.29	
PULL 55 Bale	40	15000	7.59	3.60	29.11	5.63	44.92	160	0.28	0.00		0.28	
STACKERS													
		Life = 12	Annual Hours Use = 80		Annual Repair Rate = 3% of Replacement Cost								
4 ton Rectangular	80	20000	14.81	7.38	37.48	7.50	67.17						
8 ton Rectangular	120	28000	23.48	11.96	52.47	10.50	98.41						

400 annual hours of tractor use figures are used to determine above power unit costs

11.50
per bale

5.00-6.50
per bale

0.30-0.45
hour

0.30-0.35
per bale

Years Life = 13
 Annual Use = 100, 150*, 200
 Annual Repair Rate = 3% of Replacement Cost

COMBINES

Combine Cylinder Width	Annual Tractor HP	Current Replace Cost \$	POWER UNIT OR		IMPLEMENT		TOTAL Machine Cost		Market Rate Survey 1991
			SP UNIT	Variable Cost \$/Hr	Fixed Cost \$/Hr	Variable Cost \$/Hr	\$/Hr	\$/Acre	
POWER TAKE OFF 44-50 IN CYLINDER (Tractor HP = 120)	100 150 200	48000	23.40	11.96	69.36 46.24 34.68	9.60	114.40 91.20 79.72	19.07 15.21 13.29	
LARGE PTO JD7721, CASE1682, VENS (Tractor HP = 180)	100 150 200	81000	35.14	17.14	117.42 78.28 58.71	16.20	189.90 146.76 127.19	21.87 17.27 14.86	
SP DIESEL 45 INCH (HP = 100)	100 150 200	85000	123.04 82.02 61.52	22.57			145.60 104.59 84.08	26.47 19.02 15.29	
SP DIESEL 50 INCH (HP = 120)	100 150 200	105000	152.14 101.43 76.07	28.08			180.23 129.51 104.16	27.73 19.93 16.02	12.00-14.00 per acre
SP DIESEL 60 INCH (HP = 140)	100 150 200	145000	210.15 140.10 105.08	37.10			247.25 177.20 142.17	29.09 20.85 16.73	16.00-21.00 per acre
ROTARY TYPE (SMALL) TR76, CASE1640	100 150 200	125000	101.88 121.25 90.94	33.10			214.97 184.35 124.03	30.71 22.05 17.72	
ROTARY TYPE (MEDIUM) (HP = 175) CASE1660, TR86, ACR5	100 150 200	140000	203.14 135.42 101.57	36.60			239.74 172.03 138.17	28.20 20.24 16.26	
ROTARY TYPE (LARGE) (HP = 185) CASE1680, TR96, ACR6	100 150 200	160000	232.04 154.69 116.02	41.87			273.90 196.56 157.89	28.83 20.69 16.62	
ROTARY TYPE (LARGEST) (HP = 250) ACR7, WHITE9720	100 150 200	170000	246.28 164.19 123.14	46.65			292.93 210.34 169.79	27.90 20.08 16.17	

* This annual hours use figure is typical.

400 annual hours of tractor use figures are used to determine above power unit costs

GRINDER/MIXER/DRYER

Implement	Tractor HP	Current Replace Cost \$	POWER UNIT OR SP UNIT		IMPLEMENT	TOTAL Machine Cost	Market Rate Survey 1991
			Fixed Cost \$/Hr	Variable Cost \$/Hr			

TUB GRINDER

Life = 12							
			Annual Hours Use = 80		Annual Repair Rate = 3% of Replacement Cost		
15 Tons/Hour	80	18000	14.81	7.38	33.73	6.75	62.67
25 Tons/Hour	140	26000	27.89	13.87	48.72	9.75	100.23
						25.0	4.01

PORTABLE GRINDER/MIX

Life = 10							
			Annual Hours Use = 80		Annual Repair Rate = 3% of Replacement Cost		
20" Screen	80	12000	14.81	7.38	24.65	4.50	51.34
24" Screen & Bale Shredder	100	18000	20.23	9.77	36.98	6.75	73.73

Moisture Drop

GRAIN DRYERS Life = 12 Annual Hours Use = 200 Annual Repair Rate = 3% of Replacement Cost

RECTANGULAR BATCH

Small Propane = 37 L/Hr	40	15000	7.59	3.60	11.24	0.54	30.97	23.82 (1.3T/Hr)	25.48 (2.0T/Hr)
Medium Propane = 46 L/Hr	40	20000	7.59	3.60	14.99	10.82	37.00	21.76 (1.7T/Hr)	14.23 (2.6T/Hr)
Large Propane = 90 L/Hr	40	38000	7.59	3.60	28.48	21.00	60.67	15.17 (4.0T/Hr)	10.11 (6.0T/Hr)

CONTINUOUS FLOW

Small Propane = 90 L/Hr	40	28000	7.59	3.60	20.99	19.50	51.67	15.66 (3.3T/Hr)	9.94 (5.2T/Hr)
Medium Propane = 110 L/Hr	40	38000	7.59	3.60	28.48	24.40	64.07	14.56 (4.4T/Hr)	9.15 (7.0T/Hr)
Large Propane = 145 L/Hr	40	60000	7.59	3.60	44.98	33.65	89.81	13.82 (6.5T/Hr)	9.16 (9.0T/Hr)

400 annual hours of tractor use figures are used to determine above power unit costs

Years Life = 15
 Annual Use = 150, 300*, 450
 Annual Repair Rate = 3% of Replacement Cost

FARM TRUCKS

Truck Size	Annual Hours Used	Fuel Use litres/Hr	Current Replace Cost \$	Fixed Cost \$/Hr	Variable Cost \$/Hr	Total Truck Cost \$/Hr	Market Rate Survey 1991
GENERAL TRUCKING							
2 Ton	150			25.49		40.36	
	300	30.00	28000	12.74	14.88	27.62	
	450			8.50		23.37	
3 Ton	150			30.02		48.21	
	300	37.00	33000	15.01	18.19	33.20	
	450			10.01		28.20	
4 Ton	150			36.33		58.44	
	300	45.00	40000	18.16	22.11	40.28	
	450			12.11		34.22	
5 Ton Tandem	150			47.24		73.37	
	300	52.00	52000	23.62	26.13	49.75	
	450			15.75		41.88	

* This annual hours use figure is typical.

ROCK PICKERS & VACUATORS

Implement	Tractor HP	Current Replace Cost \$	POWER UNIT OR SP UNIT		IMPLEMENT		TOTAL Machine Cost \$/Hr	Acre/Hr	\$/Acre	Market Rate Survey 1991	
			Fixed Cost \$/Hr	Variable Cost \$/Hr	Fixed Cost \$/Hr	Variable Cost \$/Hr					
ROCK PICKER											
		Life = 10	Annual Hours Use = 150		Annual Repair Rate = 6% of Replacement Cost						
REEL TYPE	60	8500	9.03	5.16	9.31	3.40	26.91				
ROCK RATE	60	6500	9.03	5.16	7.12	2.60	23.92				
RATE - PICKER COMBO	80	15000	14.81	7.38	16.44	6.00	44.62				
VACUATORS											
		Life = 15	Annual Hours Use = 150		Annual Repair Rate = 3% of Replacement Cost						
SMALL	80	11000	14.81	7.38	9.98	2.20	34.37	700.0	0.05		
LARGE	100	17000	20.23	9.77	15.42	3.40	48.82	180.0	0.27		

400 annual hours of tractor use figures are used to determine above power unit costs

MACHINERY COST

Section 1: On the top of the sheet (page 15), record all the information needed to calculate ownership and operating costs.

TERM	LINE	INFORMATION REQUIRED
Machine description		the machine and model
Today's new price	A	the suggested retail price of the desired machine (new or used)
Planning period	B	the number of years the machine will be owned
Today's used price	C	the price of a used machine that is similar to the new desired machine and as old as the planning period
Prime interest rate	D	the Bank of Canada prime rate of interest
Risk premium	E	a value estimate which represents the additional risk of the project over and above the basic prime rate of interest
Marginal tax rate	F	the expected marginal tax rate of the farm business during the planning period
Rate of inflation	G	the current rate of inflation e.g. the consumer price index
Discount factor	H	value used to arrive at the present value (dollar amount) of the future salvage value of the new machine - calculated on the reverse of the worksheet
Capital cost allowance class percentage	I	the appropriate percentage rate for the machine (tax purpose depreciation)
Capital cost allowance adjustment factor	J	value used to arrive at the after tax capital outlay as well as the after tax salvage value
Capital recovery factor	K	value that recovers that capital value of the machine through time with the specified real return - calculated on the reverse side of the worksheet

Section 2: Calculates ownership on a yearly and hourly basis

Capital recovery	1	calculates the capital value decline with a real return on investment
Insurance and housing	2	Line A x 1%
Total ownership costs per year	3	Line 1 + Line 2
Total ownership costs per hour	4	Line 3 divided by annual hours of use

Section 3: Calculates operating costs on an hourly and yearly basis

Fuel cost	5	the expected fuel consumption x the price of fuel X (1 - marginal tax rate)
Lubrication	6	Line 5 x 15% X (1 - marginal tax rate)
Repair costs	7	the average repair cost per year divided by annual hours of use X (1 - marginal tax rate)
Total operating costs per hour	8	Line 5 + Line 6 + Line 7
Total operating costs per year	9	Line 8 multiplied by annual hours of use

Section 4: Calculates total operating costs for the hour and year

Total cost per year	10	Line 3 + Line 9
Total cost per hour	11	Line 4 + Line 8

MACHINE COST WORKSHEET

Machine description: _____

Used price \$ _____	(A)	Planning period _____	Years (B) _____
Risk premium % (C) _____	(C)	Prime interest rate _____	% (D) _____
Rate of inflation % (D) _____	(D)	Marginal tax rate _____	% (E) _____
CCA class rate % (I) _____	(I)	Real discount factor (from reverse) _____	(H) _____
Capital recovery factor (from reverse) _____	(J)	CCA adjust factor (from reverse) _____	(K) _____

OWNERSHIP COSTS (Calculated on yearly basis) YEARLY CONSTRUCTION COST

- Capital recovery = $\left[\left(\text{Line A} \times \text{Line J} \right) - \left(\text{Line C} \times \text{Line H} \right) \right] \times \text{Line K}$
= \$ _____ x _____ = _____ x _____ x _____ = \$ _____
- Insurance and housing = today's new price x 1%
= \$ _____ x _____ = \$ _____
- Total ownership costs per year
= \$ _____
- Total ownership costs per hour = total costs per year ÷ hours of annual use
= \$ _____ ÷ _____ hours = \$ _____

OPERATING COSTS (Calculated on hourly basis)

- Fuel cost = litres/hr (gal/hr) x price per litre (price per gallon) x (1 - Line F)
= \$ _____ x _____ x _____ = \$ _____
- Lubrication = fuel cost x 15% x (1 - Line F)
= \$ _____ x _____ x _____ = \$ _____
- Repairs = average annual repair cost ÷ hours of annual use x (1 - Line F)
= \$ _____ ÷ _____ hours x _____ = \$ _____
- Total operating costs per hour
= \$ _____
- Total operating costs per year = total operating costs/hour x hours of annual use
= \$ _____ x _____ hours = \$ _____
- Total costs per year (Line 3 + Line 9) = \$ _____ + \$ _____ = \$ _____
- Total costs per hour (Line 4 + Line 8) = \$ _____ + \$ _____ = \$ _____

REAL DISCOUNT RATE

$$= \frac{(1 + \text{Line D} + \text{Line E})}{1 + \text{Line G}} - 1 \quad (1 - \text{Line F})$$

$$= \frac{(1 + \frac{\quad}{1 + \quad})}{1 + \quad} - 1 \quad (1 - \quad)$$

$$= \quad (M)$$

REAL DISCOUNT FACTOR

$$= 1 + (1 + \text{Line M}) \quad \text{Line B}$$

$$= 1 + (1 + \quad) \quad$$

$$= \quad (\text{transfer to line H})$$

CCA ADJUST FACTOR

$$= 1 - \frac{\text{Line I} \times \text{Line F}}{\text{Line I} + \text{Line M}}$$

$$= 1 - \frac{\quad \times \quad}{\quad + \quad}$$

$$= \quad (\text{transfer to line J})$$

CAPITAL RECOVERY FACTOR

$$= \frac{\text{Line M}}{1 - \text{Line H}}$$

$$= \frac{\quad}{1 - \quad}$$

$$= \quad (\text{transfer to line K})$$

MACHINE COST WORKSHEET

Machine description:	
40 HP Tractor	
400 hours per year	
8 litres per hour @ 15¢/litre	
average 8/yr repair cost 3% of New Price	

Today's new Price \$20,000	(A)	Planning period	13	Years(B)
used price	\$2,000	(C)	Prime interest rate	10
Risk premium	6	% (E)	Marginal tax rate	0
Rate of inflation	4	% (G)	Real discount factor (from reverse)	.243
CCA class rate	30	% (I)	CCA adjust factor (from reverse)	1
Capital recovery factor (from reverse)		(J)		
		(K)		

OWNERSHIP COSTS (Calculated on yearly basis)

- Capital recovery = [(Line A x Line J) - (Line C x Line J x Line H)] x Line K
= \$(20,000 x 1) - (2,000 x 1 x .243) x .152 = \$2,966
- Insurance and housing = today's new price x 1%
= \$20,000 x 1% = \$200
- Total ownership costs per year = \$2,966 + \$200 = \$3,166
- Total ownership costs per year = \$3,166 + 400 hours = \$ 7.92

OPERATING COSTS (Calculated on hourly basis)

- Fuel cost = litres/hr (gal/hr) x price per litre (price per gallon) x (1 - Line F)
= 8 x \$.15 x 1 = \$ 1.20
- Lubrication = fuel cost x 15% x (1 - Line F)
= \$1.20 x 15% x 1 = \$.18
- Repairs = average annual repair cost + hours of annual use x (1 - Line F)
= \$600 + 400 hours x 1 = \$ 1.50
- Total operating costs per hour = \$2.88 x 400 hours = \$1,152
- Total operating costs per year = total operating costs/hour x hours of annual use
= \$2.88 x 400 hours = \$1,152

- Total costs per year (line 3 + line 9) = \$3,166 + \$1,152 = \$4,318
- Total costs per hour (line 4 + line 8) = \$7.92 + \$2.88 = \$ 10.80

REAL DISCOUNT RATE

$$= \frac{(1 + \text{Line D} + \text{Line E})}{1 + \text{Line G}} - 1 \quad (1 - \text{Line F})$$

$$= \frac{(1 + .10 + .06)}{1 + .04} - 1 \quad (1 - 0)$$

$$= .115 \quad (M)$$

REAL DISCOUNT FACTOR

$$= 1 + (1 + \text{Line M}) \quad \text{Line B}$$

$$= 1 + (1 + .115) \quad 13$$

$$= .243 \quad (\text{transfer to Line H})$$

CGA ADJUST FACTOR

$$= 1 - \frac{\text{Line I} \times \text{Line F}}{\text{Line I} + \text{Line M}}$$

$$= 1 - \frac{.3 \times 0}{.3 + .115}$$

$$= 1 \quad (\text{transfer to Line J})$$

CAPITAL RECOVERY FACTOR

$$= \frac{\text{Line M}}{1 - \text{Line H}}$$

$$= \frac{.115}{1 - .243}$$

$$= .152 \quad (\text{transfer to Line K})$$

FUEL CONSUMPTION FOR VARYING TRACTOR HORSEPOWER¹

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TRACTOR TYPE AND SIZE	AVERAGE DRAWBAR HORSEPOWER ²		AV. FUEL CONSUMPTION ³ (Litres per Hour)	
	Diesel Tractors	Gasoline Tractors	Diesel Tractors	Gasoline Tractors
Two Wheel Drive PTO HP				
30 - 39	....	31.5	....	10.5
40 - 49	....	38.3	....	12.3
50 - 59	48.2	47.1	10.5	15.0
60 - 69	56.2	55.2	13.6	20.0
70 - 79	65.5	64.5	16.4	23.2
80 - 89	73.5	74.5	17.7	26.8
90 - 99	84.0	82.0	20.5	28.2
100 - 119	90.3	....	22.7	....
120 - 139	111.6	....	28.2	....
140 - 159	128.9	....	32.3	....
160 - 179	145.8	....	38.6	....
Over 180	148.9	....	39.1	....
Four Wheel Drive DHP				
100 - 149	135.0	....	33.2	....
150 - 174	159.4	....	40.3	....
175 - 199	182.8	....	50.0	....
200 - 224	217.4	....	53.0	....
225 - 249	235.5	....	58.0	....
250 - 274	265.0	....	61.4	....
275 - 299	281.3	....	62.6	....
300 - 349 *	305.0	....	66.4	....
Over 350 *	385.0	....	92.4	....

* Includes only one tractor

- 1 This data was summarised from "Nebraska Tractor Test Summary 1972 through 1981", The Grain Grower, Page 762 (UGG), April, 1982 and from 1980 - 1981, Agricultural Yearbook, A-5-A-E, May, 1980, pp 537-545.
- 2 Average Drawbar Horsepower for all tractors in each range.
- 3 Average fuel consumption for all tractors in each range.

NOTES ON FUEL CONSUMPTION TABLE

This data on fuel consumption for different sizes of tractors was calculated from the Nebraska Tractor Tests Reports. The fuel consumption figures are based on "75% of Pull at Maximum Power". These fuel consumption figures are for tractors under normal load in average field conditions. Fuel use per hour will be affected by:-

- load factor (75% is assumed in these estimates)
- engine RPM
- gear
- correct engine tuning

While these figures may be a good indication of fuel use per hour for a machine, fuel consumption per acre will be affected by the field efficiency related to each operation. Estimation of total fuel consumption should take this factor into account. Some factors that can significantly affect field efficiency include:-

- wheel slippage
- tire pressure
- tractor ballast
- depth of and sharpness of implement
- soil type and condition
- amount of turning required
- implement overlap in each pass
- down time to refill seed and fertiliser boxes

MACHINERY COSTS ASSUMPTION GUIDE

MACHINE	A Depreciation Lifetime (Years)	B Annual Use (Hours)	C Annual Repair rate % orig. Cost	D Lifetime Repairs % orig. Cost	E Field Efficiency
Tractors	13	600	3%	120%	.....
Combines	12	150	3%	60%	60 - 80%
Cultivators	15	250	3-8%	120%	70 - 90%
Discs	15	150	3%	120%	70 - 90%
Rowweiders	15	100	2%	100%	70 - 90%
Seed Drills	15	100	2%	100%	65 - 80%
Narrow, Packers	15	40	2%	120%	70 - 90%
Sprayers	15	50	2%	80%	50 - 80%
Stone Pickers	15	40	2%	100%	50 - 80%
Swathers	15	100	3%	95%	70 - 85%
Mowers & Rakes	15	50	2%	100%	60 - 90%
Mower-Conditioner	15	50	2%	100%	60 - 85%
Forage Harvester	15	80	3%	80%	50 - 80%
Balers					
Standard	10	80	3%	80%	60 - 85%
Large Round	12	60	2%	60	60 - 85%
Grain Dryers	12	200	3%	...	.....
Loaders	15	40	2%	90%	.....

ACRES PER HOUR

Acres per hour (or "Effective Field Capacity") can be calculated using the following formula:-

$$\text{Acres per hour (Effective field Capacity)} = \frac{\text{machine width (ft)} \times \text{speed (mph)} \times \text{field efficiency}}{8.25}$$

NOTES ON COLUMN HEADINGS

A. Estimated average number of years until a machine depreciates to 10% of original cash cost.

B. Estimated average annual farm use.

C. Estimates are based on average conditions and the indicated annual hours of use.

D. Total repairs as a percent of the original cash cost. Repairs are usually low in the first years before they begin to increase at an increasing rate as the machine wears out. These figures could be viewed as a maximum since they reflect high rates in later years.

E. Field Efficiency is a percentage estimate of the amount of time machinery is actually in use relative to the total time required to complete an operation (refer also opposite page).

E.G. A 31' cultivator travelling at 5 m.p.h. operating at 80% field efficiency would have an effective field capacity of:-

$$\text{Acres per hour} = \frac{31 \times 5 \times .80}{8.25} = 15 \text{ ac/hr}$$